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OCTOBER 13, 1981

Tectonophysics

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Speading rising the Cocos-Nerra plate boundary
ring the break up of the Parellon plate in the blocken
has resulted in the formation of the Panama Basin and
a variety and the Panama segments of subducted
introspheca identified through selection of physical
locusions of carthquaket, considering only well-located
crents, and through local mechanism desprenantions.
The matterion of raises plate boundaries, beltymetric,
rectures, and the Panamanana in through his affected the
tubduction process of the Nazce plate boundaries
of the subducting hitrospheric plate.

Dere is no single triple hanction separating the
Cartobean, South American, and Nazce plates,
leasters, the Panamanana inthrough and buttounding areas
are extronomisting gratievest compression (and a
leaser degree of north-south compression fand a
leaser degree of north-south compression finds a
server of thrust finding New to Nell, and the
Areasin campes of Eccador. Colombia, and Wensuelt
are moving as a block PAR relative to the real of the
South American plates, along a tystem of faults
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footh and the panama basin and
did Faration plate hase become segmented into three

pieces recognized in this study. From north to south, hips are: If a "Bucaramanga" segment continuous with the Carabeen sea licor nor threat el Colombia; 2) a "Cauca" segment continuous with continuous segment continuous with segment continuous w trail caraboth sea liver nor threat el Colombia; 2) a "Cauca" segment continuous with ocanit crust (keate plaid currantly being subducted beneath South America at the Colombia-Ecuador tranch and 3) an "Ecuador" segment at the northern and of the subducted inhuspherit plate which is dipping at a small angle to the test beneath northern Peru. The segmentation of the subducted plate can be explained by the buoyancy of bothymatric features which have been partially cubducted. J. Geophym. Bes., Red, Paper [81273

8130 Piace tectorics O-ZAMIC PLATEAUS, THE PRACMENTATION OF CONTINUENTS AND MONTALE BUTLDING A. Nat (Ospacismen of Geophysics, Stanford University, Scanford, (Ifornia) and tyl Ben-Avraha

Colifornia) and tvi Ben-Avreham

Any snocalcus riese in codey's oceans may be
subcreed concinanted crunce detached from previous
continuous, ancient island erce, or beseficic plies
lored by hor spots and spreading contecs. Tasse
risse are embedded to chair sespective sosing ocemoir place and are fated to be consumed at sective
nargios. Where such rises are being consumed at
pressot, e.g., rbs Besce Sidgs, they cause cossecion of cofeening, direction of the doorsofne sieb,
and possibly shifts in place boundary configuration.
Henry peac rises, including ounerous continuous
linguents, have been recognized within anomatafo
boits as ellachthomous terropes. They constitute
integents of the orogonic belcs in the North
Pacific from Mexico chrough vestern North America,
slasse, seat siberts, Ispec and in New Zeeland. The
oreganic deferrancion is chase being in possibly che
results of the occusion of the ellachthonous

result of the oversition of the eligabethonous terrans.

Many terrance has been accreted with substantial deloration elso in the Alphae chair, well before major concinent-concinent collisions. It is suggested, therefore, that the accretion of fregment may be the common procuse of the deformation phase of souncein building. Bubduction of dormal oceanic crust may be insufficient for deformation, whereas fuff concinent-continent depends critically no whether elsowithchouse terrance crused oroganic deformation in the Andeas or not.

Host of the accreted fragmence with concinental efficiation in the Andeas or not.

Host of the accreted fragmence with concinental efficiation in the Andeas or not.

Host of the accreted fragmence with concinental efficiation in the process of the concinental efficial in the Remodic-Concord oroganic belts of Condumn, beginning with a Parific domain in the Period Condumn, beginning with a Parific domain in the array Messonic and centium firmough the separation of the Schalle prate to the most butter. The reasons for this 250 offilies year breakup process are not known, but some kind of thermal process are not known, but some kind of thermal process are not known, but some kind of thermal process, possible of mantis—vide stafe, is lapited. Generated case amen, continental fragments, Andrean acceptany, oregeny), J. Capphys. Res., Rad, fapat 131311

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LITHOSPHERIC DEFORMATION ACTUENT THE
MUNICIA SEA ANG-ANG COLLESIONS EVIDENCE
FROM SHALLOY BUD INTERNEDIATE EARTHQUAKE
ACTIVATIV Sobert Mainffrey (Earth Sciences Roard, Mnivereity of (nifformic, Santa fruz, fa Gybbs Thin paper presents the results of stages narthquake survey in the Refuge ladous narthquake survey in the Refuge ladous sie. Elthouse laterapediets depth surthquaken define some dipping to the west, basesth fine Seegibs are end to the sant beneath the Relambers coloanie and in the ladous survey of the seegibs are commended to the sant beneath the Relambers coloanie and interest the control of the oblision some where the majority of the oblision some where the majority of ecticity in obserced. The concentration of certifiques foot in the 10-50 set depth range in a finited region beneath the Taiaud-Nayu Aldan suggeste that Concerques between the error proceede by shortening within beneath of the latervaning Noluce Sam platm rather than by elip a fong whellow displice plans than by elip a fong whellow displice plans between the arce and the auddocked slabs. Fullished focal mechanice colations suggest that high-engio rovers fruiting beneath the Toinud-Neyu Edga generalisation at all of the amienio aneray raises within the collision zone. The predominence of minitow raverse and etrike-niip foulting at the axie of the biteterally eudducting Moluce See fithosphara nuggostn thet ntresses ere entitle the collision and hare a large horisecutal regional ecomponent perpendicular to the ieland-nroe. The geometry and etete of etresm within the Moluce See inthosphera requires montained and the convergence between the two area and a etrong degram of coupling between the ielend-arce and the sudvocting Holuces See piete; et leent nt the praesnt mass of collision.

J. Gaophys. Rass., Red., Yepac 181425

AN ANALYSEE OF GEOTD ARCHLIES ACROSS THE MEMBOCING FRACTURE 208T DELICATIONS FOR ITEMPANAL HOMES OF THE LITEOGRAPHEE R.S. Detelek, Jc. (Graduate School of Ocasionarphy, Divis of Rhods Island, Kingctos, 21)
Geold height increases in a step-like feethou arrown oceanic freature somes due to the juriarposition of lifehosphere with difference gas and dwastry attructures. At a ridge/transform increasetion, the losisis gaold offset depends on the sagistifference across the feult and is approximately equal to 0.15 m/m.y. of age offset. The amplitude and shape of this anomaly will chample along the length of a fracture some depending on how the lithhosphere oxids. If the lithhosphere this was indeficitely (boundary layer model), the length of a fracture some from one though the width of the createled name from one late of the fracture some to the other will be crease who looks heat transfer across the fault and on forcesse to the accurage depth of compensation. If, however, the lithhosphere aventually approaches a conceant thickness (plate model), the total good offset will decrease with rium. An earlysts of algebrain Stable Crease with rium. An earlysts of algebrain Stable Crease with rium. An earlysts of algebrain fracture some to shoot on mater across the stature some to shoot on mater across the foreign of foreign to the fracture some to shoot on mater across the stature some the other portion of the fault. Although the special offsets across the stature (younger) part of the fracture some hay have been undersylvented by as much as 20-22%, this large decreation of good defease across the stature thinkness long, the special of the fracture some. A plant thickness is a shoot offset elong the Mendacino, but with injection offset elong the Mendacino but with

Editorial

AGU Endowment

Exhortetions on the need for good communications reach us from numerous and varied sources. But the nead ts particularly important in the dynamic felds epanned by tha AGU. There are a few individuale who thrive on reinventing the wheat. 1980

But most of us, although we might enjoy such activity, would ae likely pley chass, bridge, or angaga in some other challanging end recreationel activity. Prolessionally, we need to be eware of the stale of the art to be certein we are working on real probleme end taking maximum edvanisge of pertinent edvancee. And when we have something to raport, wa want to reach the widest possible audience. The reasons might be considered esitish by some: our egos, tood for our tabla, etc. Bul our work cannot impact that of our colleagues if they're not awere ot it. and no impact/no promotion.

AGU

Agency raports, journals, sympoela, and personel conlacks ell contribula to the dieaamination of information. But agency reports usually reach dozene or hundreds of individuels, while AGU journale reach thousands on first dietribullon, unfold numbers after cataloging by abstract servkes, and are sludiad in university libraries for decedes. AGU-sponsored meetings are primary vehicles for informeion dissemination through eymposie and pereonal conlacts. Clearly, a strong AGU is vital to our effectivenese as

AGU has been e strong end effactive organization over the years and, it is hoped, even without the current fund dive would continue in that role. But is 'it is hoped' good mough for us in viaw of the central role of AGU in our prolession? AGU hea slim cash reserves to carry it through any of the economic difficulties it might encounter. Even frough we do not face imminent or sudden disester, a short-term difficulty could initiate a jeedback loop of inceased duae and decreeeed membership if the damping coefficient provided by caeh rasarvas is inadequete. And il I amunduly peseimistic, wouldn't it be great if one day all membars racelved rad (or blue or green) JGR free with

There are many demands on our personal resources, inthing besic neceseitles, charitable contributions, and lelsue tima expandituree. But suraly, participation in the AGU find driva should rank high in priority for scientists in ralevantifields in view of the significance of the activities of AGU to thair futura. And, just as suraly, wa old limars ows adebt of gratilluda for the past impact of AGU on our ca-

R. J. Andarle President, Geodesy Section

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Cover. (Top) San Francisco's Mission Dolores, which was founded by the Franciscon padres on June 29, 1778, se it spisses to 1782 Ad loday. The construction of the present building began in 1782. Adjoining the mission etande the Beelilca built in 1918. (Bottom). Whan San Francisco was still under Spanish rule, Mission Dolores was known as the Mesion San Francisco de Aets. (Photos coursely of San Francisco. By of San Francisco Convention and Viettore Buresu.)

News

Budget Cuts Jeopardize Space Exploration

In the light of 12% ecrose the board cuts in the second round of tederel budgetary ection, the ennouncement by the Office of Menegement end Budget that the cut to be ebsorbed by NASA le only 6% appears to ba good newe. But this le not et ell lhe cese, even though the reduced NASA FY 1982 budget would etill be above the FY 1981 budget by ebout 4%, because the liret round of budget cuts trimmed NASA to a bere minimum. The budget hed been etrained eller ebsorbing the huge lirst-mission coets of the epace ehuttle. The portion of the budget for the shuttle elill seeme to be reserved, untoucheble, besicely ee it was elter the tirst budget-cutting round. Further, the shuttle'e costs are riging, and NASA's budget for the following year (FY 1983) Is subject to lerger cuts—a ligure of about \$1 billlon has been mentionad.

An idee of the severity of impact on NASA's operations can be had by noting one possible course now being considered: to cancel further operation of the Voyeger mission. Voyager has been rolling tor over e decade, bul luture operation costs could be prohibilitie. The spece eclences community is shocked to think that as Voyager heads towerd Urenus end Neptune for the lirst chance to obtein observetions, the trecking stations, the receiving circuits, the highly sophisticated and delicete instrumentation, which heve been part of an Immensely dedicated attort, might be shul off. The epececraft would get there, but no data would

In eummery, the proposed budget cuts could mean tho virtual elimination of space exploration and science from NASA's program. Not only Voyeger could be lost but tho Deep Space Network, the Cornet Helley and Gallieo intssions, end other missions (such as the International Solar Poler Mission) ere in jeopardy of being cut. In lect the entire planetery science end epplications functions, including the Jet Propulsion Laboratory end other NASA lecilities, could diseppeer. In one possible scenario following the budget cuts, space shuttle end Space Telescope would remein. In describing the impact of the second-round, proposad budget cuts on NASA's programs, Chemical and Engineering News (Oct. 5, 198t) slated, '... ett ideas tor new projects would have to be shelved for some time."

Tha affects of NASA's budget cuts have already spread to the Europeen spece community. New Scientist (Oct. 1. 198t, p. 2) dascribas NASA's current devalopment as

'NA5/\'s high noon':

The mood at NASA is bleak. The speca agency did not grousa whan President Resgan, for the 'netional good,' cut Into its pisns for the rest of the dacade. But an aura of frustration is unmistekable. Reagan's tinancial policias have injacted en alament of uncertainty info the finencial aquetion, and for undartakings that requira severel yaars of sovanca planning, uncertainty is

The raelity of e dayasteting budget cut that would elimineta NASA's programs of exploration of the sotar system is difficult to eeeess. NASA heedquerters is prepering a series of lest etand proposals to submit to the White House -PMB SS

Petroleum Companies Withdraw From

The 10 petroleum compenies that were to split the costs of the Ocean Mergin Drilling Progrem (OMDP) (Eos. February 19, 1980, p. 90) with the Netional Science Foundation hava withdrawn their support from the project. According to Allen M. Shinn, Jr., director of NSF'e Office of Scientific Ocean Drilling, the petroleum companies stated that they are not willing to support the fiscal 1982 efforts as planned Participation at a luture dele remains uncertein.

The move will indefinitely delay OMDP, Shinn told Eos. 'I don't think wa [NSF] can continue with the program as it is

outlined now,' ha added. OMDP wee to be a joint industry-govamment venture to explore the gaology and, Indirectly, the petroleum prospacts of the continental elopee and the ocean margins. The joini program, which would have involved much engineern, was promoted by the Carter Administration; In perticular, Frenk Prase, now president of the Netional Academy of Sciancee, worked to achieve acceptence of tha government Industry program. Government and Industry ware to epili the firet-yeer costs of \$25 million. It appears that only government funds will be available now. In August, NSF reorganized its crilling programs (Fos,

Septembar 1, p. 852), combining the Daap Sea Drilling Project (DSDP) and OMDP. The reorganization, which called for the ratirement of the Glomar Challenger and the uee of the Glomer Explorer as NSF'e sole drilling ship, also called for a dalay in drilling along the ocean mergins. Support for the reorganization from the academic community ganerally was poelilva, but reaction from industry had been

The question now is how the program will proceed. The National Science Foundation will have to reformulate its elfort; current wisdom within the academic oceanographic community le that withdrewal of the oil companies actually may be benaficial in certain respecte. Most likaly, the highly may be benancial in centally respected tha Glomar Challengar with be conlinued, but the program probably will not proceed with the haste or with the commercial incentives provided by the cooparellon of industry. Instead, more amphasis will be placed on basic research, which le perceived as desirsble by many sectore of the ocean-floor gaology community.-PMB and BTR &

Guagua Pichincha Volcano

Guerua Pichincha Volcano, north central Ecuador (0.17°S, 78.60°W). All timos are local (GMT – 5 hours).

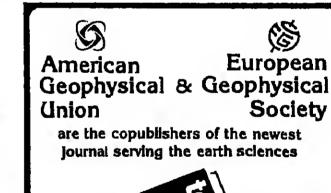
A small phreatic explosion that probably occurred in mid-August deposited line tephra as much es 1 km southeast of three new vents (3-8 m in diameter) in the summit crater. The new vente formed just east of a tava dome, about 400 m in diameter, emplaced in the center of the summit crater, probably in 1660. Pichincha's horseshoe-shaped summit creter, about 2 km in diemeter and 600 m deep, occuptes the west end of e 9-km-long messit end is breached to the west, in the opposite direction from Ecuador's cepital Quito (population 600,000), which is located at the east tool of the volceno. Aorial observers reported increased lumerolic eclivity in the summit crater about August 20. Plume heighta of ee much as several hundred meters were reported in mid-Augusi, and e group thet climbed the volcano in eerly Septembor observed a 200- to 300-m-high plume, but vepor emission had declined to only 2-3 times its normal level by early October. Temperatures of summit creter tumercles in early October were 88°-90°C, comperable to those recorded to 1978.

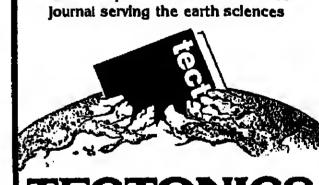
Selsmogrephs at Quilo and al Colopexi volcano (60 km to the south southeast) recorded a series of earthquakes, some of which were lerge enough to be left. However, the volcano is in a tectonicatly ectivo zono, and none of thoso events wee large enough to be delocted by the worldwide seismic net. Earthquakos on August 12 at 0804 (probably centered near Oulto) and August 21 at 0718 (probably contered about 40 km south of the volcano) had Modikod Mercalli Intensitios et til-IV in Quite. Smaller events recorded on August 25 at 0651 and August 26 at 1311, both apparently centered about 40 kin south of the volcane, were not tell, but residents of Quito noticed an event on August 28 at 1822 that probably had a nearby epicenter Selsmographs installed on the north, east, and south llanks of the volcario Soptember 25-27 had recorded no local seismicity Imagnifudo flirostioki about 1.5) as of Octobor 7. Dry tilt stations were emplaced boginning 28 Soptember at sites 11.25 km north-northeast, 9 km east, and 7.25 km south southwast of the central dome.

A UNDRO volcanological team of John Tombin, Karl Gronvold, and J. C. Sabroux errived in Equador October 1. Chemicel analyses of gas samples collected by Sabroux on October 5 will be compared to his analyses of gases collected from the same tumaroles in 1976.

The last major eruption from Guagua Pichincha occurred in 1660, when 40 cm of ash lell on Quito and nuees ardentes flowed down the west flank. Several minor phreatic eruptions were reported in the 19th century, the most re-

Information contacts: Minard Hall, Escuela Politecnica. Casilla 2759, Oullo, Ecuador, J. C. Sabroux. Centre des Faibles Radioactivites, CNRS, 91190 Git Sur Yvette. France; National Earthquake Information Service, U.S. Gaological Survey, Stop 967, Denvar Faderal Canter, Box 25046, Denver, Colo. 80225. 5





TECTONICS

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Dynamice Explorer Now Operational

The Iwo Dynemics Explorer satellites, launched from the Western Tasi Renge at Vandenberg Air Force Bass in Callformia into separete polar orbite, are now tully operationel (see EOS, 86, p. 633, Auguel 25). Allhough the spacecrell did not echieve the ptenned orbit because of a short burn of the second stage in the Delte leunch vohido, the scisnlific Instrumenta aboard both satellites nre oporoling. NASA expects that all mejor scientific objectives of the mission

The lower orbiting DE-2 oblained science dele tor 12 days after its instruments becams operational in late August. Science operations were resumed September 4 aller the spacecrett hed been repositioned 180° to permit proper instrument cooling. This meneuver must be performed evsry 6 months, owing to the spacecraft'e elittudinel relationship to the sun.

The higher orbiting OE-1 had all instruments ecliveted over the lest weekend in August and reeled out 63 of the 100 m (208 of 328 lt) of the long wire entonnas on board. The 6-m (19 II) Astromast booms were elso srected.

In the process of activating the satenaes and booms, the spacecrall's spin rats dropped from 84 to 9 rpm. Megnetic lorquing will be used to increese the spin rets to the desired 16 rpm, scienlisis seld, at which time the wire aniennss will be extended.

The satellites are in copienar orbits end ere designed to provide an understanding of the processes by which energy from the sun, in the form of light weves and matter, flowa through interplanetary apace, enters the region around the earth controlled by the magnetic torces from the earth's magnetic field (mngnotosphero), and eventually is deposited in the earth's atmosphere to produce the eurora (northern lights), effect radio transmission, end parlings influonco basic weether patterns. |Source: NASA.]--PMB 🕱

New Publications

Tracking Down Geothermai Watere

Two geochemists say that massuring gas ratios in geothermal waters that heve surfaced from deep within the earth cen help pinpoint the hottest spot in a geothermal reservoir. The technique evolds inserting long thermomelers or drilling desp holes into the sarth.

When water falls as rain or flows in rivers and lakes, if picks up trom the etmosphere such gases as nilrogen, oxygen, and argon, explain David Norman, assisiant geophys-Ics protessor et the New Mexico Institute of Mining and Technology, end Carl 8srnhsrdt, a graduals student. As the water sinks into the serth end heats up, most of the almospheric gases bubbls off. Than, the weter absorbs other gases such as hallum and carbon dioxide from the surrounding rocks and soll. When this hot weter rises to the surface by convection, Norman Iold Eos, it cools rapidly but retains its underground gasas. By calculating the retios of carbon dioxide to methane in the water that has risen to the surface, the temperature of the water when it was deep within the asrth can be sellmated, the geochemists sey. This new mathod could halp tep with precision aconomic osothermal reaervoirs.

Finding a reservoir for exploration is not sufficient, say Norman end Bemhardt, because hol geothermal weters can Itow laterally within rock frectures for kilometers before surfacing. Drilling for geothermal watere is expensive; the Ischnique using gas ratios could reduce drilling errors, they

Normen and Bamhardl, while working on a broader study of gesee reisled to geothermal waters, found that by measuring several ratios, they could locate precisely the holtest geothermel spot in a given region. Their work was conductad partly in the Lightning Dock area of aouthwest New Mexico, site of previous geothermel work. The gas retio lechnique agrees with previoue geothermel exploration

studies on the location of the hottest geothermal spols. they report.

The gas ratios used by the New Mexico Isam are carbon dioxide to methene, hellum to nitrogen, hallum lo sigon, carbon dioxide lo nitrogen, end carbon dioxide to argon. The total percentage of carbon dioxide in the gasses is also

Geophysicists

James F. Fitzgereld, Jr., 32, was awarded posihumously his doctorel degree et the University of tosho commence ment earlier this year. He joined AGU in 1969 as a student member of the Voicenology, Geochemistry, and Petrology section. He was killed in the May 18, 1960, eruption of Mount St. Helens.

David W. Stearns has been appointed interim dean of the University of Oklahoma's new College of Gsosciances. a major component of the university's proposed \$30 million Energy Center. Before becoming the university's first Monnett professor of energy resources in September 1980, Slesms was professor of geology at Texas A&M's Center for Tactonophysics.

Murrey B. McPherson, 61, dled on August 20. A mamber of the Hydrology section, he joined AGU in 1975. He was a former chairman of the AGU Commillee on Urban Hydrolo-

Charles Gill Morgan, 74, died on August B, 1980, Hs joined AGU in 1946 es a member of the Salamology sec-

Jamea A. Peoplea, Jr., 70, a lormer AGU Fellow, died on Dacember 12, 1960. He was editor of the Journal of Geophysical Research Irom January 1959 until December 1968. He joined AGU in 1939.

the book (268 pages) consists of lables of minsrels ar-

ranged, following Leraen and Bermen's example, in order

of increasing index of refraction (n, n, or n) for use as de-

terminative tools in the laboretory. These span two pages

for each mineral entry and convey considerably more diag-

nostic information then Larsen end German. Most helpful.

especially for obscure minerala, is that each entry makes

an abbrevieted reterence to en extended work where you

As with eny publication, there ere flaws, but, in my opin-

ion, none ere laiei. The aection on emphiboles, tor exam-

ple, continues the use of species names like barkevikils

now been decanonized by the IMA Commission on Mineral

Names. Such slips and a truly minimel number of technical

this book makes. There is room for improvement, parhaps

by the addition of a ahort introductory chapter on the optical

conventions to be lollowed (engles like XAc, for example,

are given negative values if they are meesured in the ob-

tuse angle between crystellographic axes). This information

ples and Techniques, but could profilebly be recast hare in

Finelly, though it aeema tritle in e review these days, the

the interest of providing a single comprehensive reference.

price could be cut by about 50%. At \$39.95, this book

makea an excellent desk reference, but I cennol recom-

mend requiring it as a textbook, and i'm certainly not going

to be nonchalant ebout the inevitable immersion oil slains

on my peraonal copy. I will use it, though, and I recom-

mend it to eny serious student of optical minerelogy.

is to be found in their eerlier book, Minare! Optics: Prind-

errors do not detract from the overall positive impression

and lerrohastingaite that, though well entrenched, have

can learn more about the mineret.

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605 offers classified space for Positions Amirable, Positions Wanted, and Services, Supples, Courses, and Announcements. There se no discounts or commissions on cleasified se no discounts or commissions on cleasified se. Any type that is not publisher's choice is pared for si display retsa. EOS is published yeekly on Tuesday. Ada must be received in wing on Monday 1 week prior to the date of the

Replies to ada with box numbers should be dressed to: Box ____, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, POSITIONS WANTED Reles per line 15 limes-\$1.00, 6-11 limes-\$0.75,

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Physical/Cosstel Occonographer. The Cenier for Coastel Studies, Scrippe Institution of Ossesography, has an opening for a physical, postal oceanographer to conduct research in an egenem tremibes evitevorni io mergor priogre ment lechnology with emphasis on sediment re-serves to the forcing functions of waves, winds and ments. The incumbent will select and publish on esserch projects into fundamental physics of mastal and harbor sedimentation and edvance altensives to current coastal engineering practices. Appointments are for 1 or 2 years (renewable) at the postgraduate research or segletent research evel Qualifications for postgreduate research lave we PhD or equivalent in physical oceanography/ tostal processes and/or applied physics/mechanics with emphasis on granular/fluid machanics. Apponiment et the assistant research Isvel requirea the above qualifications and a demonstrated publistion record. Salary from \$18,138 to \$25,200 comensurate with qualifications. Su ed including resume and at Isaat three names of references before 1 Oecember 1981 to: Or. D. L. Iman, Oirector, Center for Cosatet Str crips institution of Oceanography, University of Céfonia et San Oiego, La Jolia, Celliomie, 92093. Request position profilee at the same address. An equal opportunity/effirmetive ection smployer.

luff Scientists/Scientific Progremmere. Re seich & Date Systems, Inc. has openinge evali-the for Staff Scientific end Scientific Programmer to work in areas involved in the processing and ep-pleasion of date from aetellite based remote sens-ing systems. Particular needs involve the study of mospherio dynamics specifically as it relates to he statosphere/roposphere Interlece, stratospher-tomposition and dynamics and dynamic feedack mechanisme. Other needs exist in the areas d shivetillude computation, objective ensiyels and radelive transfer. Successful candidates will have in advanced degree in meteorology, physics, eetowary or methemetics with a strong computer some background particularly on IBM equip-Will Sand resume in confidence to: Research & Otis Systems, Inc., 9420 Annapolle Road, Lan-

inteter Geodetic Survey, NOAA. The Neload Oceanic and Almoepheric Administration (NOAA) announces a Senior Executive Service Ve-Stary for the position of Oirector, Geodelle Re-teach and Development Laboratory (GROL) in the National Geodetic Survey, a component of the Ne-tical Ocean Survey. The duty localion is Rockville, Manual Communications of the Communication of the Nelaryand. The salary range is \$47,989-\$50,112.50 per suntum. Duties include providing technical end ministrative supervision over employees end acwhite of GROL; advising officials on the state of scientific knowledge in geodesy and making recom-mendations for research and development; exercis-ing scientific and technical knowledge of contributesional lournele and makir ntations at national and international meetegi; and advising end consulting scientists end ex-sulves in improvement of geodesy and related eds. Expedence in management of scientific progams, geodesy, and solid earth sciences is re-gared, Apply to: NOAA/NOS-5001 Executive Bou-Ward, Rockville, Maryland 20852. Attn: MB/ NOAA is an equal opportunity amployer.

Stalty of Tennesses, Knoxville/Facul-7 Posttlens. The Ospartment of Geological Sciences (Mein Campus of the UT System) invites optications for two or three tenure freck teaching/
lessich positions effective September 1, 1982.
The appointments will be at the assistant or esbecause professor level in:

Sedimentology or Low-Temperature Geo-American Petrology or Mineralogy.

2 Metamorphic Petrology or Mineralogy.

The Ph.D. is required. Duties will include pursuit of an active research program see well as teaching and advising at graduate and undergraduate levels. Preference will be given those with documented research capabilities. Applicants will be interviewed at the Cinchnall G.S.A. meeting, Send recurre (International G.S.A. Send recurred (International G.S.A. Send Committee, Department of Geological Sciences, University of Tentasse, Knowlie, TN 37918. Application deadline, January 15, 1982.

UTK is an EEO/Title IX/Section 504 employer.

Research Pasition in Chemical Oceanogre-phy. Californie Institute of Technology, Olvision of Geological and Planetary Sciences. The position of research lellow ie being offered at Callech for re-search in oceanography, investigation of the isotop-ic composition of neodynum and rare earth abun-dences in sea west end endings in the isotopdences in sea weter end sedimente is now being carried forward. The mechanism of injection of REE Into sea water will be studied. The differences in Nd/144Nd in various weter massas |Piepgras et al., Earth and Planet Sci. Lett. 45, 223-236 and Plepgrae and Wassarburg. Earth end Planet. Sci. Lett 50, 128-138 (1980) is now being carried for ward ea an exploratory venture in order to deter-mine the origin and chemical behavior of REE in the ocean and the potential use of 150 Nd/140 Nd as e traper. The laboratory lacifiles for eample prepa retion and analysis are fully functional and will be available. Applicants should have training in ocean ogrephy and a good perspective on general physi-

Send resume and references to Professor G. J. Wasserburg, Lunetic Asylum, California Institute of Technology, Pasadene, CA \$1125. Caltech is an aqual opportunity/effirmative action

Petrologieli Korthern tilinois University. Applications are invited for a tenure track position igneous or matemorphic petrology et the assi or secodete professor level beginning either or secodete professor level beginning either Jensery, 1982 or August, 1982. A Ph.O. degree is required and post-doctoral research experience is preferred. The auccessfut candidate will be expected to pursue en active research progrem, issch st the undargraduete end graduate level, and direct Masters and Ph.O. graduste research work. Facilities housed within the Department of Geology in-clude a fully automated electron microprobs, SEM. solid source and see source mass spectrometers AA, XRO, and XRF. To receive full consideration. please send resume, atstement of research inter ests, end the names of three references, by November 1, 1881, to Jonathan H. Gerg, Search Committee Chairman, Department of Geology, Northern tillinole University, OeKalb, Minols, 60115.

Goismologist. Applications are invited for a postgraduets reaserch position in eatsmology at the Scripps tnetitution of Oceanography. Appli specializing in sil areas of salemology will be con-eldered, elthough preference will be given to recent graduates interested in seismic wave propagation. cularly as explied to the ocsenic environme and digital signal processing. The position has a duration of one year, with the possibility of extenaion to two years, and an annual atipand of \$18,860. Please send resume end three references to either Or. Thomas H. Jordan or Dr. John Orcutt, A-015, Geological Research Olviaion, Scrippa Inati-tution of Oceanography, La Jolia, CA 92093, prior to 1 Oecember 1981

Scripps Institution of Oceanography, University of California, Sen Diego is an affirmative action/equal

Peculty Positions. Arizone State University, Opportment of Geology, Applications are invited for two tenure-track faculty positions, one at the assistant professor level and one at the associate level, beginning in August of 1882. One of these positions requires a candidate with interests in applying modern actid state science to geological phenome na. The selected candidate should develop an active research program end may use the extensive opportunities offered by the Facility for High Reso-bution Electron Microscopy et ASU. Teaching duties with include undergraduste mineralogy. Candidates for the other position should complement and ex-tend existing etrangiths in the department. Possible areas legitude by temperature candidative, heavy srees include low temperature geochemistry, heavy Isotope geochemistry, solid earth geophysics, tec-tonophysics, end related fields. The ability to use modern techniques in both field and isboratory studias and to integrate diverse approaches is highly desirable. Please send a detailed statem. research end teaching interests end a resume with names of four references to David Krins. Particles of four references to David Randey.

Department of Geology, Artzone State University.

Tempe, AZ 65287, by January 15, 1962.

Artzona State University Is an equal opportunity/
effirmative action employer.

Visitor Appointments: NCAR. Visitor Appointments et the High Altitude Observeiory are available for new and established Ph.O.'s for up to one year periods to carry out research in solar abuston are a seriod and additional and additional and additional additional and additional additional additional and additional ad physics, solar-ierrestrial physics, and related sub-lects. Applicants should provide a curriculum vitae including education, work experience, publicate the names of three scientists femilier with their work, end a statement of their research plants. Applications must be received by 15 January 1982, and they should be sent to: Visitor Committee, Hig. Attitude Observatory, National Center for Atmospherio Research (NCAR), P.O. Box 3000, Boulder Colorado 80307. NCAR is en squal apportunity/alsemetive action employer.

University of Hawelli Feoulty Festions.
The Department of Geology and Geophysics and the Hawell institute of Geophysics of the University of Hawell are sasking applicants for two tenure track positions becoming available Jenuary 1, 1862. Applicants should have specialization in [1] 1882. Applicants should have seein none or more of marine geophysics with emphasis in one or more of the fields: merine asismology, imagnetics and gravithe fields: merine asismology, imagnetics and gravithe fields: by, or (2) marine geology/sedimentology. One of these positions will be filled at a rank of bull profes-

these positions will be filled at a rank of full profes-eor, the other at assistant or associate level.

Applicants should have demonstrated ability to conduct and promote marine research commensu-rets with the level of the application. Ability to teach et all levels is expected. The positions will be joint ones on an 11-month basis with the Department and the institute and will involve both teaching and and the institute and will involve both teaching and research responsibilities. Apply with resume, expected level of appointment and the names of 3 referes to Charmen, Personnel Committee, Department of Geology and Geophysics, University of Hawaii, Hohobulti, Hawaii 98822.

Closing date for applications is January 1, 1982.

The University of Hawaii is an altimative-actions, equal opportunity employer.



Centro de Investigación y Desarrollo de Petróleos de Venezuela S.A.

INTEVEP,S.A.

INTEVEP, S.A. Is the Research and Development Center of Petróleos de Venezuela, S.A.. The Center carries out applied research in the areas of petroleum exploration, production, refining and petrochemicals.

Immediate openings exist In Caracas, Venezuela for experienced geologists, geophysicists and engineers specializing in rock mechanics. Candidates should have a Master's and/or PhD degree. Bilingual (English/Spanish) candidates preferred. Primary responsibility will be the setting up of a laboratory to study the behavior of rocks and/or unconsolldated sands that contain oil.

Please submit a resume to the address below no later than December 31, 1981.



750 Welch Road, Suite 204 Palo Alto, CA. 94304

Petrotogist-Economic Mineralogist-Univer-sity of Oklahoms. Applications are invited for a tenure-frack position, effective September 1, 1982 at the assistant protessor level, in petrology and economic mineralogy. The successful applicant is expected to teach graduate courses in his/her ape-cialty, to halp teach undargreduate courses in min-

cisity, to help teach undergreduate courses in min-eralogy-optics-petrography, and to pursue an active research program. Consulting and interacting with mining companies ere encouraged.

The University of Oklahoms has made a mejor commitment to diversify the program in the School of Geology & Geophysics. As a result five lenure-track positions are open for the fall of 1882. Six new laculty were added to the School in the fall of new taculty were added to the School in the lall of 1981 (bringing the total full-time faculty to 15), and an additional six positions will be evaluable during 1883–1985. A new building that will house the School tain the design stage, and the successful applicant will participate in equipping it. The Ph.O. degree is required for this position.

Preference will be given to petrologists with a strong chemistry background and with a demon-streted interest in the economic geology of metalic and non-metalic mineral deposits. Qualified applicants should arrange to send transcripts of all college and university work, resume, statament of research interests, and three lettern of reference to: Dr. Maryellan Cameron, School of Geology and Geophysics, University of Oklehoma, Norman, Oklahoma, 73018. Deadlina for applications is December 31, 1981. Faculty members from the School will be interviewing at the November G.S.A. meeting in Cincinnati, Ohio, and at the December A.G.U. meeting in San Francisco, Califor The University of Oklahoma does not o

sity of Oklahoma does not discriminate on the basis of race, or sex, and is an equal

EARTH SCIENCES -

The Lamont-Doherty Geological Observatory of Columbia University Invites scientisis intereeled in eny field of the earth sciences to epply for the following fellowshipe: two posidoctoral fellowships, each awarded for a period of one yeer (extendable to two yeers in special instances) beginning in September 1982 with a etipend of \$22,500 per ennum. Completed epplications ere to be relumed by Januery 15, 1962. Application forms mey be obteined by writing to the Director, Lamont-Doherty Geological Observetory, Pelisades, New York 10964. Award announcements will be made Februery 28, 1962 or shortly lhareefter. The Observatory elso welcomes epplicetione from candidalee for poeldoctoral research essociele positions in this discipline.

University of Leads/Isotope Geologist Applications are invited for a post of Posidoctoral RESEARCH FELLOW in the Department of Earth research programme of the Isotope Calofogy Group in the Department includes geochronology oriented perticularly towards evolution of metamolphic belts, and applications of radiogenic lactope geochemistry enetic probleme and the present state and past history of the earth's mantle. Equipment svailable includes two colid-source mass spectrometers (Micromass 30 and Isomass 54) for Sm-Nd. U-Pb, Rb-Sr and REE determinations and two MS (Oe for K-Ai and 39Ar.40Ar with supporting chemical tecli-tes which ere dedicated to these programs and to projects in oceanic isotope geochemistry. The suc-cessful applicant will be expected to include work in one or more of these fields and to collaborate in appropriate current projects. Salary within the range £6070-£10160 according to age, qualifications and experience. Informal enquiries may be made to Professor J. C. Briden. Further particulars and application forms (il destred) may be obtained from the Registrar, The University, Leeds LS2 SJT. UK, quoting reference number 48:20:HG. Closing date for applications 30 November 1981.

Queternary Sedimentation end Tectonics or Geophysics. The Geology Department at Mismi University Invites epplicants for a position in either the field of Quaternary sedimentation (including glacial deposits) and tectonics or the field of geophysics. This position is to be filled at the Assistent Professor level beginning in August, 1982. The successful candidate will teach both undergraduate and graduate courses, must possess the Ph.O. degree and have documented ongoing re-

Quaternary Sedimentation and Tectonics. Ideally pplicants should have research and teaching interesis in: [1] basin development and recent lectonics; (2) Quaternary sediment transport and depositional processes including tilt deposition; and (3) geomor-

hology. *Geophysics*. Applicants should have research and teaching interests in: [1] relations between crustal structure and basin and continental marg evolution; or (2) general geophysics to include aress from among seismology, geomagnetism, gravity, electrical or heal-flow studies.
Vietling Assistant Professorship in Osolo-

gy. The Department also invites applicants for e visiting assistant professor position beginning in August 1982. The position is of 1 to 3 year duration and is nontenure track. The successful candidate must have the Ph.D. and will be responsible for teaching introductory-level courses as well as teaching and study in the person's area of research interest. This area is unspecified. The successivi applicant will be chosen on the basis of qualifica-tions and ability to interact with researchers currently on the elaff.

Applicante should send e resumé, transcripte, three (3) letters of reference and an outline of teaching and research interests to: Or. A. Dwight Baldwin, Jr., Chair, Geology Department, Marsh University, Oxford, Onto 45056. ativa action amolover.

Climate Change and Society: Consequences of Increasing Atmospheric Carbon Dioxide

W. W. Kellogg and Robert Schwere, Westview, Boulder. Colorado, xil + 178 pp., 19B1, \$15.00 (hardcover), \$8.00

Raviewed by H. E. Landsberg

Rocent years have seen a large number of books, some by single suthers and some by many authors, on manmade influences on climate. Examples for 1980 ere one by Bernard end one edited by Singh and Deepak. These fully or in pert address the potential effect of increasing carbon dioxide in the almosphere. That increese is an established fact and ite anthropogenic origin by the burning of tosall luals end delorestation is undisputed. The same cennot be sald about the consequences, eithough there is reasonable agraement that it will lead to e warming of the lower almosphare on a global scale. The great merit of the book by Keltogg and Schware is that II stresses all the uncerteinties that remain. Watter Orr Roberts in his loreword, which provides the motivetion for the eurvey, already states that magnitude end timing of a CO₂ effect ere uncertein. But he also outlines that the potential impact on the food aupply in e world with a growing population makes concern with the

Another happy circumetance is thet Kellogg, e scientist with long experience in the sludy of etmospheric enargetics, is teamed up with a political scientist, who is ter better quelified to judge the societal end economic problema than would e meleorologist. The euthors, in en overview, show clearly how lerge are the complexities. The beginning chapter then shows, perhaps loo briefly, the nature of the sludy ol climetic changes (natural) end alterations (man mede). More explicit is an exposition of impacts of climatic change on crops, water supplies, live stock and lisheries, health. and recreation. A turther substential chepter is devoted to the question of how to cope with the potential evil effects of Increasing almospheric CO2. Are there viable elternetives to tossil fuela for energy production? Are there viable airaleglea to reduce the influx of this gas into the almosphere? Can international agencies, International agreements, and International cooperation mittigate the menace? And what can be done for the developing nationa that need vest additions to their energy consumption to Improve their economic statue? It is veluable to reise these questions, but the enswers remain obscure. Some of them given in the book ere eliher nelve or likely to be ineffective. The discussion of intemational afforts in the environmental field is very veluable, however, because it is usually omitted in euch tree-

Three eppendices give background information. It might heve been better to heve included the information in the mein text because they superbly lituatrate the uncertainline. Can we be sure that readers will psy attention to appendicss? The lirst shows the problems with predicting future energy use. The second comperes the predictions of a number of climete models developed up to early 1980. There ere more of them now, with considerable disagreementa emong them. The lext points out the cruciel role of the ocean, which is ee yel incompletely modeled. That role is not only thermal inertia, as ataled, but also involves the mixing death of the CO2. The third appendix eliempts to get a better handle on possible distribution of the climstic elements over the earth in case of global warming. Part of this is from an earlier reconstruction of the allithermal period of the Holocene by Kellogg. The use of the much shorter interval of modern records is not convincing be-

cause they do not really compere conditions when the whole globe was colder or wermer. Single years will not raflect equilibrium conditions. There are invertably compensa-

The book has a very complete coverage of the Englishlanguege illerature, clied at the end of eech section. With one exception of a classical 1903 book by Arrhenius no loreign language tille is cited. Actually, Arrhenius publiehed the idea of the effect of 'cerbonic add' contents of the air on the temperature of the earth's surface seven years eerlier (Phil. Mag., 41, 237-278, 1696). The complete omiseion ol significent work in Russian lenguage is regrallable. Even the Important work by Budyko hae been ignored, even though two of hie books have been Iranaleted into English. One of these was published by AGU. (Climatic Changes,

AGU, Weahington, D.C., 1977) Anyone who wishes e quick orientation on the almospheric CO2 problem can obtain it from this book. It elso covers the national and internetional piena to study the whole problem of climatic changes and their impacta, eepacially the World Climetic Progrem insugurated by the World Meteorological Organization.

H. E. Lendsberg is with the institute for Physical Science end Tachnology, University of Maryland, College Park,

Optical Mineralogy: The Nonopaque

W. R. Phillips end O. T. Griffen, W. H. Freeman, San Francisco, Celli., xl + 677 pp., 1960, \$39.95.

Reviewed by Sleven M. Richerdson

Perhaps the most heavily used contribution that Esper Larsen or Harry Bermen made to the field of minerelogy was their volume entitled The Microscopic Determination of the Nonopaque Minarais, published in 1934 es USGS Guiletin B46. My own copy, now dog-eared end etained with immeration oils, has long since justified the dollar I peld for Il 15 yeere ago. Unfortunately, the Larsen and Sermen lawout of print and unobtainable by budding minerslogists. So, I might add, is the other stendard work of the ere, Winchell's Elements of Optical Mineraology, II: Descriptiona of Minerals. In this conspicuous gap, Phillips end Griffen have creeled e new book that they hope will become the logicel successor to both of these classic vol-

Their book is written in two sections. The liret (398 pages long) contains detailed discussions of the common nonopaque rock-forming minerals, plus pyrite, magnetile, and rutile, which, lhough opeque, were epparently loo common to ignore. These are arranged according to the order of the Dans system, end each is neelly organized around e standard formet thet includes Composition and Structure, Physical Properties, Color and Pieochroism, Form, Cleavage, Birefringence, Twinning, interference Figure, Optical Orientetion, Distinguishing Featuree, end Occurrence. Most valueble for the average user ere the excellent crystal drawinge, sections, end (for some minerels) stereogrephic proections thei accompany each description. Though a little busy on occasion, these drewings are clearer than many in Winchell's book and considerably less confusing than those in Deer, Howie, and Zussman. Severel of the descriptions. are elso accompanied by bleck end white photographs. showing the minerals in representative thin sections. For major mineral groups (e.g., pyroxenes, amphiboles, clays, leidspara), the authors also provide comprehensive tables of physical and optical properties. The second section of

位于特别的原理。 医多种性

Sleven M. Richerdson, Department of Earth Sciences, lowa Stete University, Amas, Iowa. AVAILABLE ENGLISH
M.I. Budyko's
Climatic ... dasis with the principal testures of modern climate and Value of the past of modern of the stance of modern of the stance of the past Alaciation Sades 213'00 Ilai bijos 300 bades 213'00 Ilai bijos

Published by AGU,

Orders under \$50.00 must be prepaid.

The Department of Geology of the University of New Mexico is pleased to Invite nominations or applications for the Caswoti Silver Distinguished Professorship in Geology. This endowed professorship shall be ewerded for pariode of up to two years to earth eclantists of dietinguished eccomplishment and internetional reputation. The proleseor-ship may be held by eclentiste of all specialties of the aerth eclencas in he broadest sense, and the major criterion for selection is that the individual be an activa, productiva leeder in his or her iteid of research. The recipient must carry out a vigorous research program whits in residence at UNM. The recipient is expected to interect with the lecuity end etudents of the Department and to provide one or more seminare, in an dvancod topic of hiether choice, during each acedemic year. The Foundation will provide unusually edventegeoue remuneration comman-eurate with the dietinguished neture of the appointment. In addition, a generous ellocation for trevel and operating expenses (to include excre-terial support, snalytical services in department laboratories, use of field ehicles, and preporation of menuscripts) will be provided.

Applications or nominations should include a detailed resume and brist stelement of major raceerch accomplishments. Applications or nominetione should be forwarded to:

Rodney C. Ewing, Cheirmen Department of Geology University of New Mexico Albuquerque, New Mexico 87131



Instrumentet Analys VStaff Research Asso

otate Iti. Job # 81-08-23. Overseo computer-

autometed weve-length dispersive XRF spectrome ter. Minimum qualifications; two yeers analytical

preferebly but not necessarily with XRFC or NOVA

computer. Dulles include: maintenance and repair of equipment; soltware development in FORTRAN for on-line minicomputer; participation in deelign and

execution of stretegies for energying trace metels in geological materials; and instruction of users. After liket year, opportunity exists for personal research

es time permits. Applicants should list equipment and applications with which they're experienced,

and responsibilities therewith. Salary \$1765/month.
Apply to Personnel Office, University of California

Sante Cruz, 1 158 High Street, Senta Cruz, Ce.

Fletd Research Postlions. The Exploration

Research Leboretory of the Colorado School of

Mines may have openings for a field party manager and or an assistant field party manager on or about Jenuery I. 1982. Poston level will be negotiated

based on qualification. This position invalves, prin-cipally, selemic deta ecquisition but the person ma

ing realityity, gravity and magnetics, stc. This is an opportunity to participate with a large geophysics research and development group. Specific responsibilities include planning and coordination of tiald work, training at crew members, and supervision of pre-processing. The position is most challenging and offers wide score for initiation, and scornings.

of responsibility. Interaction with industry professionals, ERL atail, and faculty members of the Department of Geophysics is required. It is a position for growth, and chellenge. A bechefors or masters degree is required for each of the positions. Field

crew experience would be helpfut. Ability to direct aubordinates, interface with diverse groups, end communicate results is essential. Extensive field

time is required for the Assistant Field Manager.

Schedules are not firm and are subject to resear commitments and research time trames. Typical

ecademic environment tringa berrefits are available. It interested in further details or in aubmitting an ap-

plication, contact Dr. James K. Applegate, Director, Exploration Research Laboratory, Colorado School

of Mines, Golden, Colorado 80401. The Colorado School of Mines is an offirmative

Groundwater Hydrologiet. The Minnesola Department of Natural Resources, Division of Wa-ters has a vacancy at the Principal Hydrologist level

for an experienced groundwater hydrologist to pro-vide leadership for a program of ground weter stud-

ies and monitoring to support State Weter alloca-

tion decisions and to provide quantitative assess-

forms to: Sarah P. Tufford, DNR-Division of Waters, Third Floor Space Center Building, 444 Lalayetta Road, St. Paul, Minnesota, 55t 01. Present salary renge: \$23,323 to \$31,132 shinually, subject to revision by the pear thirty.

University of South Floride. 3 New Faculty

Positions in the Department of Marine Science: The Department of Marine Science et the University of

South Ffortier of three new legulty positions beginning in September 1982. Applications from persons in

in September 1982. Applications from persona in the following specialities are especially encouraged: Microbial scology, marine ichthyology, carbonals petrology/elable isotope paleoclimetology, and physical oceanography.

Rank and salary will depend upon professional experience and accomplishment. The minimum stipend for Professor is 330,000, Associats Professor, \$22,00; and assistant professor, \$20,000. The ninemonth positions are fully state supported and teniurs earning. Duties will involve approximately 75% research and 25% leaching. Applicants must have the Ph.O. in fields appropriate to their specialties and promising records of research accomplishment. The closing date for the receipt of applications is January 31, 1982.

Applicants should send resumes with three references to Chairman, Department of Marine Science, University of South Florida, 140 Seventh Avenue South, St. Petersburg, Ft., 33701.

The University is an elimnative action equal opportunity institution.

action/equal opportunity employer

ficant field time is required for the Managar.

participate in a wide renge of field ectivities inc

and offers wide scope for initiation and accept

experience or equivalent academic background

The deadline for applications is January 1, 1982. The Geewell Silver Foundation is an equal opportunity employer.

University of Meryland/Feoulty Pacttion. The University of Maryland Invites applica-tions from highly qualified acientists for a toruro track faculty position of the assistant or associate plassor level in the Department of Meteorology Candidelos must have o Ph O, in meteorole physics, engineering or chemistry and have an area of specialization that will snable them to lead a research program in anvironmental physics and ir pollution. The research ectivity of the candidate should complement the maisorological resourch of the Department and continue the strong interaction in the physical sciences across departmental lines. Duties will include teaching senior graduate courses related to environmental physics and sir pollution and developing an active research probons and experience. All applicants should sand curriculum vitee, e brief statament of research interasts and names, addresses and telephone num-bers of those professional references to: Professor Ferdinand Saer, Chairmen, Department of Meteo-rology, University of Moryland, Cottege Park, MD 20742. Closing data for applications is 1 December

The University of Maryland is an equal opportuni-

Position in Reflection Selemology:Rica University, Houston, Texas. The Department of Geology plans to expend its geophysical program Emphasis will be on reflection seismology. At this time applications are for the first of two open faculty positions. The successful epplicant will help in the search for and selection of the second

Your main responsibility will be to leed our de-partment into the crea of modern reflection setsmology. Your main teaching and research interest should be in the acquisition and processing of refection seismic data. You should also help in developing rigorous undergraduate and graduate cur-ricula, which are supported by the traditional strength of the Math Sciences, Physics, and Electrial Engineering Departments at Rice. Enthusiasm to work with and undertake some joint projects with our geologists is essential
Our plans are to acquire a computer system con-

figured for high quality data processing. Substantial seed money for this tacility is stready in hand. Crealive cooperation with the oil and geophysical industry in Houston, including a reasonable amount of consulting, is succuraged. Salary will be com-mensurate with qualifications and experience. Please send your curriculum vitae, a summary of experience in seismic processing, 8 etatement of research interests, and names of three or more raierences to Dr. A. W. Betty, Chairman, Department of Geology, Rice University, P.O. Box. 1892, Hous-ion, Texas 77001. Application deadline—December

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search associate appointment is available in the area of space plasma physics. Topics of study include date from election beam experiments aboard the space shuttle and the behavior of low snergy plasma in the magnetosphere. Resumas and names of three references should be sent to Professor P. M. Banka, Radio Science Laboratory, Department of Electrical Engineering, Stanford University, Stanford University, Stanford

sty, Stanlord, CA 94305 Stenford University is an equal opportunity am-

University of Wisconsin River Feller Struc-tural Geologist/Geophysicists Applications are invited for a tenure track position in Geology. Preference will be given to those candidates with Prierence will be given to those candidates with amphasis in structural geology or general geophysics. However, other emphases will also be considered. The Ph D. Is required, and a desira to teach is essential. Academic rank and satary are dependent upon experience of the individual. Course responsibilities will include physical geology lecture and isbotelory, atructural geology, and other upper division courses commensurate with background and training Candidates should send a letter of epopulation resume, and three tetters of recommendaprication, resume, and three letters of recommende-tion to: Professor Samuel F, Huffman, Chairman, Department at Plant and Earth Science, University of Wisconsin-River Falls, River Falls, Wisconsin-Sin-River Falls, River Falls, Wisconsin-Sin-River Falls, Wisconsin-River Falls is an affirmative action, squal opportunity employer. Final data for receipt of applications is January 15, 1982.

University of Californie, Davier taneous Patrologist. The Department of Geology Invites applications for a tenure-trock position in the tield of neous petrology, et the Assistant Profeesor level effective for the ecademic year 1982-1983. Preference will be given to cendidate whose research ence will be given to contribute whose research demonstrates e thorough understanding of field, theoretical end experimental approaches to the actence and who show promise for high callbar research on fundamental problems. The successful to the contribute of the successful to the callbar of andidate will be expected to contribute effective to the existing teaching progrem in igneous petr

gy et both the undergraduata and graduate levels.
Departmental facilities includa a thin-section leboratory and electron microprobe, both of which are supported by full-time personnel, an experimental laboratory with high pressure pleton cylinder end low pressure externelly heeted aquipment, a scaning etectron microscope, stable isotope laboratory as well as the usual equipment (XRF, XRD, computers, etc.). The University of California at Davie is located conveniently to sreas containing ell types of

The finel date for racelet of applications is Febru-ary 1, 1982. The University of Celliomia is an equal portunity/affirmative action employer. Intersaled individuels should eand their resume

Jera H. Lippe, Cheir Department of Geology University of Celifornia Davis, Celifornia 95919.

Faculty Positions: The University of nticipetes one or two openings for tenure-track leculty in August 1982. One or more visiting profes sorshipe, et any rank, are also expacted to be aveileble. Preference will be given to candidetes with research activity in the following experiments ond theoretical areas: estronomy, estrophysics, stomic physics, condensed metter physics, atamen tary particle physics, nuclear physics, plaema phys-ics, end space physics. The poeltions involve un-dergraduate end graduala teaching, guidence of repersone should send a résumé, a statement of research interests, and the names of three profeesional references to Search Committee, Depart-ment of Physics and Astronomy, The University of

Geophysical Fluid Dynamicist/Physical Gosanographer. Applications are solicited for a junior lacuity position in ocean physics or dynamics to begin in the ecedemic year 1982-83, Areas of interest to the Department include enelytical, numerical and leboratory modeling of physical proc-esses and phanomena in the sea.

The University of towa is en equal opportunity/at-

Yale University fa en equel opportunity/affirmetive action employer and encourages women and mem-bers of minority groups to compete for this position. Curriculum vitae, publications, and the names of three or more relaress should be sent by 31 De-cember 1981 to: Robert 9. Gordon, Cheirmen, De-5865. New Heven, CT 065t 1.

Feculty Poeltioner The University of Alabepositions to be filled by Aug. ta, 1992. Two of the lone are expansion to eccommodate 6 devel oping Ph.O. program. Applicants would be expected to leach undergraduate and graduate courses end actively pureue research. Ph.D. le required to refention of position, Assistent Professors pre-

Position 1—Structural Geologist.
Positions 2 & 3—two from following Interests:
Hydrogeology, applied geophysics, low tamperature
geochemistry, economic geology/ore deposits, cost
petrology, palynology, and physical sedimentology. Closing date: Jan. 15, 1992. Send resume, tranacripts, and three letters of reference to: Dr. W.

Gary Hooks, Acting Chairmen, Department of Geology, The University of Alabama, 8ox 1945, Univer-The University of Alabame is an equal opportuni-

ty/affirmative ection amployer

Faceity Positions Environmental Engineer-ing. Seginning January or September 1982. The position requires undergraduate and graduate teaching and aportsored research activities in the areas of water quality control and water resources An earned doctoreta is required and at least one degree in civil engineering is preferred. Henk will be at the assistant professor level and salesy will depend upon qualifications, Apply to: Or. Leater A. Hoel, Cheirman, Department of Civil Engineering, University of Virginia, Charlottesville, Virginia

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POSTDOCTORAL FELLOWSHIP

The Naval Postgraduate School. Monterey, CA.

Wa ere seeking a recant doctoral graduate with an interest in geomagnatics and some background in geophysical instrumentation and comput er data analysis. The candidate will be expacted to participate in ongoing experimental program of sea floor magnetic measurements using the School'a research vessel and remote land based station. Stipend compatitive with current practice. For further Information, contact Prof. O. Hatnz Dopt. of Physics, Naval Posigraduats School, Montaray, CA, 93940, or call (408) 646-2118. NPS is an equal opportunity affirmative action

Structural Geologist/University of Wys-ming. The University of Wyoming, Department of Geology and Geophysics seeks applicants for a tenure treck eppointment in etructural geology ex-pacted to be aveilable beginning tell semeeter 1882 or earlier. Duties will include leaching of undergradusta and graduate courses in structural get supervising MS and PhD theses, and research in structurel geology. Appointment et essistant protes sor level la pretarred, but applicante requesting appointment et higher renk wilt be coneidered. Sater open. Applicante must have PhD degree and be versed in quantitetive theory as well se field appli cations or modern structural geology and ragional

Applicants should provide, by January 1, 1982, a rasume, three latters of reference, end a latter of application including a statement of current research interests and courses which the applicant sels qualified to leach. Applications should be sent

Or. Robert S. Houelon/Head Department of Geology and Geophysics Univarelty of Wyoming Laramia, Wyoming 82071-3006.

The University of Wyoming is en equal opportunity/affirmetive ection employer

Engineering Geologist/Geophyeloist. The Department of Geological Sciences, University of Saekaichawan, has a vecent tenurable posttion in engineering gaology/geophysics. Applicants should be qualified to leach undergreduets and graduale courses and to conduct research in engineering geology. A background in efructural geology may be eppropriete. Well-equipped facilities are evallable for research in rock mechanics, fluid flow through porous medie, ecoustic, end alectrical properties of rocks, and permefrost. Good opporturities exist for joint research with quelifications end experience. Send epolications, detailed personal resume including the names of at least three relerees, and other supporting deta to Dr. W.G.E. Caldwall, Heed, Department of Geological Sciences. University of Saskatchewen, Sasketon, Sasketch-

Pissae note: until November 15, 1881 consideration will be given only to applicants who are Cens-diens or landed immigrants, after that dete at appli-cations will be considered.

City University of New York, (Brooklyn College): Faculty Positions. The Depart ment of Geology anticipates tilling several tenure track positions at Full Professor level. (Salary renge up to \$43,400). Highty qualified individuals will be considered for distinguished eppointments at an additional \$6,000.

Write candidates who have distinguished them-selves in any field era welcome to contact us, we are particularly interested in openings in: anergy resources (coel/petroleum), exploration geophysics, environmental geology or hydrogeology, coastal

sedimentology, economic geology.

Successful epplicante with be required to institute an active research program, supervise Master's end Ph.D. theses. Nominations and applications with current vitae should be sent to: Dr. S. Shatta charl, Chairmen, Dept. of Geology, Brooklyn College of City University of New York, Brooklyn, New York 1t 210. Positions open until filled. Srooklyn College, CUNY, le an effirmetive action

Geophysics University of Colorado

The Dapartment of Physics, University of Colorado at Boulder, and the Co-operative Institute for Research in Environmental Sciences (CIRES), Universi-

ty of Colorado/NOAA ere currently recruiting for a tenure track faculty member, in the Department of Physics, with simultaneous appointment as a Fellow of CIRES, who will complement the Department's active role in the University's Interdepartmental Graduate Program to Geophysics. We are particularly (but not exclusively) seaking persons with experience and interest in the sreas of space geodesy, geodynemics, or related areas of theoretical geo-

appointment will be et the level of assistant professor (minimum salary: \$20,000 per academic year) and is expected to start in the fall of 1982. The appointment entails full participation in the Department's undergraduete and graduata teaching programs (including offarings in the appointee's specialty), supervision of graduate students in appropriate areas, and the development of an active research program.

Candidates should send a letter of interest, a current curriculum vitae, and have three letters of reference sent no later than 1 January 1982 to: Chairman

Department of Physics Campus Box 390 University of Colorado Boulder, Colorado 80309.

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ykginia Polytechnic Institute and State Intensity Genier Research Associate. Inmeting and abundant research and publishing opunites, including new University-WEROSEIS eyelem, VAX 11/780 computer. that have experience in theory and application of election selemology, and be interested in the apacoust reflection selamotogy to the edution of

send resumes to: Or. O. Fl. Wones, Department o Geological Sciences, Virginie Potylechnic theli-us no Stele University, Gleckeburg, VA 24081the University te an equel opportunity/effirmative

Yels University/Department of Geology and Geophysics. Applications are solicited for a techy position in solid earth geophysics to begin are academic year 1962—83. Areas of interest to te Department include seismology, exploration pophysics, mechanical and physical properties of son and minerals, geomagnetism, and lectone-

yes University is an equal opportunity/affirmative ution employer and encourages women and mem-ter of minority groups to compete for this position. Curiculum vitae, publications and the names of the or more relevess should be sent by 31 Dacenter 1981 to Robert B. Gordon, Chair pulment of Geology and Geophysics, P.O. Box #64 New Havan, CT 08511.

seleisnt Prolessorships/University of Virtale. The Department of Environmental Sciwas University of Virginia invitee applications for treatments track assistant professorahips begin--Câmatology/melec

Applicants should have a Ph.D. and expect to act undergraduete and graduete level courses in rei wes of specialization and to pursue a vigoras mearch program within the context of an inter-sectory department. A curriculum vitae, a brief ment of research interacts and names of three radults who may be contacted for references, rold be sent to George M. Hornberger, Depart-rel of Environmental Sciences, Clark Hell, Unirsty of Virginia, Chartottaaville, Virginie 22903. The University of Virginia is an equal opportunity/

I mative action employer.

Priva University. The Department of Gaokerces invites applications for a faculty position strong January or July 1982, in the broad field of averaiogy-petrology-geochemistry. A Ph.D. is re-amd and preference may be given to accentists cetha an automated elactron microprobe, mass sectionals and laboratory for stable lactope audat le surge of high temperature end high pree-ter equipment, including turneces for controlled a experiments, as well as X-rey equipment. The amenul applicant will be expected to perticipate 있는 programs, as well as actively engage in re-내가 Rank and salary are open but will be com-resume with qualifications.

Purdua University is a tend grent, state support ed institution committed to academic excellence, and is en equal opportunity/equal eccess employe For further information please contact Dr. Henry O. A. Meyer, Dept. ot Geosciences, Purdus Univer-sity, West Lafeyette, IN 47907 (Tet. 317-494-3271). liceling data for applications is November 10.

Supervisory Physical Scientist. The Re-

search Facilities Centar (RFC) of NDAA in Miami, Florida, ia seaking a senior level aciential to manage its Research Systems Group. The RFC equips maintains, and oparates aircraft, halicoptars and ground besed equipment specifically for etmospha incumbent will direct a group of scientiets, angi-neers and technicians involved with collection, cali-bration, quality control, tormetting, documenting and delivery of date to users of the RFC. This posttion is in the Competitive Service. The grade and entrance level eatery of the position is G9-14. \$37,871° per annum. Future ealery edjustments are subject to the Merit Pay system. OUALIFICA-TIONS: BS or higher degree in meteorology, phys ics, math, oceanography, or the physical eclences. In addition, 3 years of professional experience which has equipped the candidate with the knowledgae necessary to perform the above duties. GE-LECTIVE FACTORS: Applicants must have experiand be capable of directing research in instrumentation physics, calibration techniques, advanced computer techniques and spectral enetysis. Addi-tional technical information may be obtained from Dr. C. S. Emmanuel (305)526-2938 or FTS 359-2938. TO APPLY: Current or tormer lederel em-ployees should submit SF-t71 and CD-332 [Employee Appreisal). Form CD-332 mey be obtained by calling (305) 381-4454 or FTS 360-1454. Applicents not employed by the Federal Governmen ehould submit a complete application package for "Physical Science Positions-1300". These forms may be obtained from the nagrest Office of Pers nel Menegement (OPM). ALL APPLICANTS MUST 9U9MIT THEIR PUBLICATIONS RECORD. All epplications should be submitted to NOAA/ERL Area Personnet Office, 4301 Rickenbacker Causeway Miami, Florida 331 49. Rel. Vac. No. NOAA/ERL 91-232, Applications must be received by November t 3, 1891, to receive consideration. AN EQUAL OPPORTUNITY EMPLOYER, 'Selary subject to increase due to October comparability edjustment

Selemologist/University of Uteh, Search extended: the University of Uteh is expanding its geophysics program in the Department of Geological and Oeophyelca by edding a tenure track faculty member in selemology at the assiglent to associat professor level. Applicants with backgrounds and specialties in seismic reflection, seismic imaging. end theoretical salamology will be given pretar The Individuel will be expected to teach undergrad usia end graduate courses, and to pursus an acti research program with graduete aludants. The de-partment has modern backing and research pro-grams in geology end geophysics, end has close essociations with the numerical analysis and dela processing groups in computer science, electrics

engineering end mathemetics. The geophysics component of the department has already research and teaching programs in seismology, olectrical and elactromagnetic methods, thermal properties of the earth, end potential helds. Current research in seismology includes: eeismological and eerthquak rasearch utilizing e new PDP 11/70 computor with plotter end terminals; monitoring of the intermounain selemic belt by a 55 station telemeterart notwork utilizing a now on-lina PDP 11/34 computer, major experimenta in selamic retraction profiting, in vastigations of selemic propagation from synthetic selemograms, application of inverse theory to sols mology, seismic properties at volcnnic systems and ellled research in tectonophysics. The closing dete for applications is December 31, 1981. A Ph D. is required for this position. Applicants should submit a vita, transcripts, a letter describing his her research and teaching goals, and names of live por-sons for reference to William P. Nesh, Chairman, rtmant of Oeology and Geophysics, University of Utah, Galt Lake City, Ulah 84112. University of Utah is an equal opportunity effirma-

STUDENT OPPORTUNITIES

Berth and Plenatery Solenoos, Massachu eatts institute of Technology. Our Depentment has research and teaching assistentships available for new graduata students anrolling in September 1882. Research opportunities oncom page e wide range of topics in planetary aciences geophysics, geology, geochemistry, and patriology, Bludents with undergraduete majore in goology, physics, chemistry, methomatics and engineous are encouraged to apply. Dotniled information can be obtained from Debby Rocckar, 54-812A, M.I.T., Cambridge, MA 02 [39, [817] 253-3380

Graduate Regearch Assistantahina I Physical Gesanography. Opportunities for graduate study with Rosearch assistantiship available and property of the control of able for students interested in M.S. or Ph.D. programs. A summar program with elipend is open to college juniora Write: Douglas Caldwell, School of Ceanography. Orogon Stale University. Corvallis, OR 87331

Graduate Teaching & Research Assistantahips/University of Houston. Ginduate hing & research assistantships ovailable to quelited parsons interested in Space Physics at the University of Houston Our experimental prorem lectures rocket & balloon-borne studios of the onosphers & magnatosphere-ronosphere coupling Emphasis has been on active experiments, most recont being e rocket-ballcon compaign et Siple on, Antarctice in December 1980. Futura work includes a study of pulsating surgre & participation in Waterhole II, an auroral quanching a po The theoretical program is on pleams waves in the solar wind & modeling of phenomena lotated to current experiments. Assistantships for his typear students begin at \$800 mo along with out of state billion walvers. Graduate Chairman, Physics Dept. University of Houston Central Campus Houston

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ing, planning, designing, exploring, dnilling, or dig-ging in connection with ony form of energy, you noed this complete, up-to-dete book about the noild'a geothermal-enorgy dopoets. Includes production and reserves for arous and wells. Herdcov or, 8 4 9 inches, 292 pages. Table of contents, drawings, Index, references, 1976 \$84 Taisth As-sociatos, 120 Thunder Road, Sudbury, MA D1776

Fundamental Concepts in Medeting Fluid Flow & Solute Transport in Porous Media. Short course on Fundamental Concepts in Modeling Fluid Flow and Solute Transport in Poroue Medie, January 26-29, 1982, Princeton University, Princeton, N.J. Principal Lecturor, George F. Pindar This course will focus on aquation develop ment end numerical modaling for a wide variaty of porous medie problame. Case studies and handson computer exercises will be included. Contact: Or. Goorge F. Pinder, Dept. of Civil Engineering fcoda 123). Princolon University, Princeton, N.J. 08544. [609 921-1123]



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Meetings

AAAS Pacific Division Meeting

A calt for papers has been issued for the 63rd Annual Meeting of the American Association for the Advancament discience. Pacific Division. The meeting will be hald June 20-25, 1982, at the University of California at Senta Barbars. The American Meteorological Society and the Almo-Spheric and Hydrospheric Sciences Section (section W) of MAS Pacific Division will cosponaor sessiona and other Mograms on cosstal mateorology, climatology, oceanogra-

Abstracts about be aant by March 15, 1982, to John Ler, Program Chairman, Department of Gaography, Cati-Mia Stats University, Hayward, CA 94542 (telephone: 15-881-3193). Raquests for special squipment and audioisual aids should accompany the abstracle.

Abstract format and additional information can be oblained from Alan E. Leviton. Executive Director, AAAS (Paofic Division), California Acadamy of Sciences, Golden Jele Park, San Francisco, CA 94118 (telaphona: 415-752-1554). Nonmembers are ancouraged to attend. 38

Coastal Structures

call for papers has been leaved for 'Coastal Structures 83, a specialty conterance on the design, construction, namenance, and performance of port and coastal structhes. The conference is schadulad for March 9–11, 1983, hither transfer of the hihe Washington, D.C., araa. Prospective authors are invited to submit sbatracts of

400 Words or less on a audiact related to one of the followng topics: groins, breakwaters, jettlas, ssawalls, revetmenis, submarged pipelinea, pila-supported atructurea, port and marina structures; interaction of coastal structures with ways, currents, and sediment transport; salsmic and foundefining roblems with port and coastal structures; functional and shuctural dealign, construction (methods, equipment, and methods). and materials), maintenance, and operation of port and Castal structures; and innovative case aludies dealing with port and coastal structuras.

The conference will foous on coastal rather than deep Wan articluras, on lachnical rather than regulatory, socioeconomic, environmental, or management aspects of coastal structuras.

Abstracte, due April 15, 1982, should be sent to J. Richard Wasser, due April 15, 1982, should be sent to J. Richard Structure. rd Weggsl, Chairman, Program Committae, Coastal Struchas 83, c/o Coastal Engineering Research Center, Kingmen Blvd. Fort Belvolr, VA 22080.

Fun Run

This unofficial activity will be held sometime during AGU week in San Francisco. Same course as lasi year, but with special recognition to slowest finishers In sach section. Organizers are 8III 8raca, Art Bosticher, and Etleen Vargino. Look for notices near tha registretion desk.

Antarctic Research Series Vol. 33

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L.D. McGinnis, editor

Cora ensiysis is tha main and is of DVDP. The wesith of scientific data from unital contribution to unit glacial history is a significant to the came the resident venture. Japan, DVDP char cientists. The very will be the basis for the next projects to be carried out in

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Ocean Sciences: AGU/ASLO **Joint Meeting**

Februsry 16-19, 1982 San Antonio, Texas Convenor: W. D. Nowlin, Ir., (AGU) and R. W. Eppley (ASLO)

Abstract Deadline: November 10, 1981

ACU/ASLO Joint Meeting February 15 19, 1982 San Antonio Tesas

Special Seasions *Additional speciel sassion

Ocsan Climata and Biological Productivity Connec-Ovarview of Large Oceanographic Projects Biology and Physics of Gulf Stresm Rings

Reletions Between Biology end Circulstion in the Gulf of Mexico Geological Effects of Ocean Circulation

Anthropogenic Inpute in the Ocean: Diverso Points Processes and Recources of the North Pacific

Smail Lake Limnology

Marina and Frashwster Bioturbeilon Ocsan-River Interaction: Sedimentation and Chont-

Perticin Fluxes in the Water Column and Benthic Soundary Layer

Relations Between Meaoscale Physical and Biological Processes Coastel Processee

Biological and Physical Massurement Tachniques Microecala Processes and Effects on Blota Physics and Blology of Ice Edges . Physical, Chemical and Biological Processes in

Large Lakss *SANDS (Shalf and Nearshore Dynamics of Sadimanialion)

Call for papers published in EOS, June 23.

1981 AGU Fall Meeting

The 1981 Fell Meeting will be held et the Jack Ter Holel end the Holiday inn/Griden Getewey in Sen Froncisco trom December 7-11.

Registration

Evaryone who attende the meeting must ragister.

Preregletration (received by November 17) savee you time and money, and the fea will be refunded if AGU roceives written notice at inability to eitend by November 30. Registration

	Preregiatrellon	At-Meeti (after t t/
Member	\$55	\$70
Studeni Member	\$25	\$40
Nonmember	\$75	\$90
Student nonmember	\$32	\$47
Discount Holling Holl	902	4.

Registration for I day anly is evetleble at one half the above rates. Members of the American Meteorological Sociely, the American Society of Phalogremmetry, Union Geofisica Mexicane, American Congress on Surveying and Mapping, and the Canadien Geophysical Union may register for the meeting et the

AGU member relee.

The ditference between member (or eludant member)
registration end nonmember registration mey be applied to
AGU dues if a completed membership application is received el AGU by February 13, 1982. Current AGU annual mamberehlo ratas ere: \$20 members; \$7 studeni members.

To preregister, till out the registration form, and return it with your payment to the AGU Office. Your receipt will be included with your proregistration material at the meeting. Preregistrants shauld pick up their registration material at the preregistration deak of the Holidey Inni/Golden Geteway Hotel. Complimentary bedges for guests not attending the acientific sassione will be available at the registration desk.

Scientific Sessions

Seo Program Summery next page. Both hotels will be used for ell disciplines.

Hotel Accommodations

A block of rooms (\$41 singles; \$47 doubles) is being held for meeling ettendees at the Jeok Ter Hotel and at the Holldey Inn/Golden Gateway. Reservetions ere processed as they are received, so il you wish to stey et a perticular holai, you should make your reservation es early se possible. Remember your fallow scientists need a room. Reserve in one hotel only. Don't be a no-show!

Reservationa must be received by November 12 to be conlirmed. Please use the form provided to be sesured of the special AGU rate, and mall it directly to the hotel of your choice. Do not write or call the AGU nilice for room reserve-

Free parking is evaluable only is registered gueste at sech

Social Events

Two partias are plenned for registrants. The ice Breaker will be on Manday et the Jack Ter Hotel; and a wine and cheese party on Thursday et The Holldey Inn/Golden Getaway Hotal.

Complimentary rafreshments will be assved delily at both hotale from 9:30 to t0:30 A.M. and 2:30 to 3:30 P.M.

AMERICAN GEOPHYSICAL UNION

1981 FALL MEETING

REGISTRATION FORM

Golden Galeway Hnlet December 7-11, 1981

Bedge Identitication

NAME ON BADGE

AFFILIATION

San Frencisco, Calitarnia

PLEASE PRINT CLEARLY.

Jack Ter Hole#Haliday Inn-

Buainess Meetings and Sections Luncheons/Dinner

The AGU Council will meet Sunday et 5:00 pm in the Jepeness Pavillon (formerly the Garden Room) of the Jack Tar Hotel.

The Teolonophysics section business meeting will follow an ollermoon technical seasion on Mondey evening at 5 n'clock in the international Room, Jack Tar Hotel.

The Nikko, Van Nese end Pine; the Casa de Crietal, 1122 Post Streel; and the Four Sees, 731 Grent Avenue, are the reateurante that will provide an etmoaphere of conviviality for The eaction luncheons and dinner as listed below:

Tuesday, December 8

Gaodesy Seismology	Case de Criatal Nikko	noon	\$8.00 \$3.75 (subsidized)
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- Program: Jim Dieterich, USGS Program Coordinator for Earlhqueke Prediction, will speak on the current elatua of the Nellonal Earthquake Prediction Program.

 Sponsors: Kinemetrics, Inc.; Teledyne Industries, Inc.;
- W. F. Sprengether Instrument Co., Inc.

Wadnesday, December 9

Hydrology	Caes de Crialal Nikko Banquel	noon	\$8.00
Oceanography	room	noon	\$8.25

PLEASE CHECK

Program: Farris Wabs in will speak on Research
Outlook from NOAA:

Nikko (T/K room) 11:45 e.m. \$8.25 Four Seas 8:00 p.m. Solar-Planatan

Speciel Chinese Gourmel Banquel

 Business maeling et 8 p.m., followed by the benquet at 7:30. Recervations in advence required) Progrem: Franklin Mertin, NASA heedquarters, will speak on the present status and future of NASA's space eclence program. [12] [2]

Sponeor: RCA Asiro Electronica/Government Systems

___Zlp__

Thursday, December 10

Planelology/ Volcanology, Nikko Banquet Geochemistry, and room Pstrology	noon	\$8.25
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 An opportunity for membars of both sections to meet in en informal atmosphere lo discuse subjects of mutuel Interest.

Geomegnellam Nikko (T/K room) 11:45 e.m. \$825 Palaomagnaliam

Advance reservations are suggested (SPR-required) and will be processed as they are received based on availability of space. Complete the registration form now.

AMERICAN GEOPHYSICAL UNION FALL MEETING

ACCOMINODALIO149		December 7-11, 1981			
Single	\$41.00	Arrival Date	АМ Л	PM ()	
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Vajeger 2 at Selum (I) (Tues AM) Vojeger 2 at Selum (Tues PM) Vojeger 2 at Selum (II) (Tues PM)

Geodesy/Earth Rolation (Mon PM) vavily Field (Tues AM) Satelie Altimetry (Tues PM)

geomsgnatism and paleomegnetism Economagnetiem (Wed AM) Geomagnetiern: Core, Crust (Wed PM) Sediment, Rock Magnetlem (Thurs AM) ligneitle in Organisms (Thure PM) Sequier Varietion/Transitions (Fri AM)

Ension-Sedimentation—I (Mon AM)
Ension-Sedimentation—II (Mon PM) Robards' Equation-I (Tuee AM) Roberds' Equetion—ti (Tues PM) nund Water Geophysics-I (Wad AM Gound-Weter Geophysics-II (Wed PM) Gound-Weter Contamination-I (Thurs AM) wand-Weter Contamination-II (Thurs PM) Water-Quelity Verlability (Fri AM) General Hydrology—I (Fri AM)
Ground-Weier Hydrology (Fri PM)

Heleprotogy Inte Elements (Mon AM) ust Rader (Mon PM) MSA Water Vepor Exp (Tues AM) Emospheric Chemietry (Tues PM) Lightning (Wed AM) Sedification & Lightning (Wed PM) Sum Dynamica & Electrification (Thurs AM) Add Precipitation (Thurs PM) (male & Dynemice (Fri AM) Radiation & Aeroeole (Fri PM)

Oceanography Vaginal ice Zone t (Mon AM) Trokal Ocean I (Mon AM) HEBBLE I (Mon AM)

Marine Chemistry (Mon AM) Merginel to Zone II (Mon PM) Tropical Ocean II (Mon PM) HE8BLE II (Mon PM) Marginel ice Zone til (Tues AM) Verna Channel (Tues AM) MANOP (Tues PM) Mid-tetitude Variebility (Tues PM) Upper Ocean I (Wed AM) West Coast Shelt I (Wed AM) Hydrothermel Vents (Wed AM Upper Ocean II (Wad PM) West Coast Shelt II (Wed PM) Sedimente and Sedimentation (Wed PM Southern Ocean I (Thurs AM) Lakes and Estuaries 8, C (Thurs AM) Coastal Topogrephic Effects (Thure AM) Southern Ocean II (Thura PM) Chemistry of Lakes and Estuaries (Thurs

Coastel Oceanography (Thurs PM) Physical Measurements (Thurs PM) MARSEN I (Fr AM) Lakes end Estueries P (Fri AM) Large Scale Circulation (Fri AM) MARSEN II (Fri PM) Polymode Local Dynemics (Fri PM) Paleoceanogrephy (Fri PM)

Planatology Outer Plenet Satellites (Wed AM) Outer Plenets (Wed AM) Primitivea (Wed PM) Microwave Observetions (Wed PM) Soler System Valcanism (Thurs AM) Terrestrial Planets I (Thurs PM) Terrestrial Planets II (Thurs PM)

Seismology Globel Selemicity I (Mon AM) Normal Modes (Mon AM) Global Seismicity, II (Mon PM) Earthquake Sources (Mon PM) Merine Seiemology (Tues AM) Mostly Merine Mulitchannel (Tues PM) Mostly Multichannel Theory (Wed AM) California Seismicity (Wed PM) Body Weve Theory (Wed PM) Crustel Structure (Thure AM)

Precursore and Radon (Thure AM) Crust and Mentle (Thurs PM) Mt St Helens & More (Fri AM) Rock Phyeics (Fri AMI Arraye and Instruments (Fri AM) Geolhermal and Scattering (Fri PM) Nuclear Explosions (Fri PM) Strong Motion (Fri PM)

Solar-Planstery Relationships: Aeronomy Stretospheric Chemietry (Tuee AM) Middle Almosphere/D-Region | Tues PM| Thermoophere (Wed AM) Almospheric Emissions (Wad PM) enospheric Holes (Thure AM)

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Magnetospheric Physics Aurora and Substorms I (Mon AMI Currents and Flatde (Mon PM) Ioncephere/Plasmasphere (Tueo AM Waves/Instabilities I (Tuee AM) Reconnection (Tues PM) Energetic Particlea (Tues PM) Oynemics Explorer (Wed AM) Leb/Space Experimente I (Wed AM) Jupiter/Seturn I (Wed PM) Lab/Spece Experiments II (Wod PM) Jupiler/Salurn II (Thure AM) Aurore and Substorme II (Thure AM) Waves/Instabilities II (Thurs PM)
Models and Methodology (Fri AM) Space Plearne Theory I |Fii AM| Sow Shock (Fri PM) Spece Pleame Theory II (Fri PM) Geomagnetic Puleotione (Fri PM)

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Sedimentary Basins (Mon Am) Viscosity and Convection (Min AM) Rheology of Lithusphero I (Mon PM) Frectures and Stress (Mon PM) Ridges end Hnt Spots (Trace AM) Rheology of Lithosphere II (Tues AM) Rhenlogy of Lithusphere III (Tues PM) Hitls end Ynung easins (Tues PM) Mailne Geophysics (Wed AM) Rheology of Lithosphere (V (Wed AM) Suluros—Caustel Structures (Wed PM) Growth of Fractures (Wed PMI Subduction Zones (Thurs AM) Equations of State (Thurs AM) Continental Fault Zones (Thurs PM) Earthquake Prediction I (Thurs PM) Oceanic Trensforms (Fr. AMI Earthquake Prediction II (Fr. AM) Earthquaka Prodiction III tFri PMI Heal Finw (Fri PM)

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Particles and Fields onosphere

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Particles and Fleids-Magnetosphere

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